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CASUARINA PINASTER,
THE WESTERN AUSTRALIAN COMPASS BUSH.

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The species *Casuarina pinaster* was named and described by C. A. Gardner (*J. Roy. Soc. W. Aust.*. 27, 1941:166). It has not achieved mention, so far as the present writer is aware, in any other literature, and the purpose of this paper is to outline certain remarkable features of the growth habit which were not mentioned by Gardner.

The latter described both the male and female floral parts, but did not make it clear that these are borne on separate unisexual plants which are moreover quite different from one another in habit. The female plants, readily recognised from the seed cones which they bear, have distinct main stems and a number of main branches which align themselves parallel to it, the whole axis thus formed being inclined at an angle of 30 deg. to 40 deg. from the vertical and in a consistent southerly direction. Minor branches arising from the main stem and laterals all grow out at right angles to the latter and towards the upper side of the plant. They bear, densely clustered, the small green twigs which in *Casuarina* take over the function of leaves, the true leaves being present as mere scales. All species in *Casuarina* share this peculiarity but *C. pinaster* is one of a small number in which the terminal segment of stem is elongated, rigid and pungent-pointed appearing very similar to the sclerophyllous true leaves of many of the other species belonging to the Proteaceae, Myrtaceae and other families which associate with *C. pinaster* in a scrub-heath community. Several whorls of scale leaves are present at the base of the terminal segment revealing its true nature, but the spur branches of female *C. pinaster* do appear to the observer to be densely clustered with spiny leaves resembling pine needles, hence the specific name. The fruit bodies or seed cones are borne on the spur branches and give the impression of sheltering for protection under the mass of spines of the apparent leaves.

The male plants on the other hand are less tall, there is seldom a definite leading shoot, the lateral branches tend to spread normally, there is no more than a vague tendency to lean over, the leaf-like twigs are not densely clustered and the whole bush takes on a thoroughly ordinary and undistinguished appearance.

In order to quantify the above information, 20 female plants were measured at random in three different populations of *C. pinaster* in the Newdegate district. Population A was alongside the main Lake King-Newdegate road 15 miles west of Lake King. Population B was located in reserve No. 20346 along a track from Mt. Madden to Newdegate 15 miles SE of Population A and

Population C was along Hall's Track 6 miles west of the western edge of Lage Magenta within reserve No. 25223 and 30 miles SW of Population B. In each case the angle of inclination of each plant was obtained by measuring the vertical height of the tip of the plant above the ground, and the distance from the foot of the measuring staff to the base of the stem. The compass bearing of the inclination was also recorded to the nearest degree. The results are shown in this table.

	POPULATION		
	A.	B.	C.
Mean Height (vertical)	7.50 ft.	4.50 ft.	5.25 ft.
Mean Bearing	192.2°	200.6°	186.3°
Range of Bearings	159° to 215°	177° to 222°	141° to 210°
Mean Angle to Horizontal	68.5°	64.6°	63.3°
Range of Angles	48° to 77°	48° to 76°	52° to 74°

The bearings have been adjusted for compass variation, to read true. There is no point in a statistical analysis of the main effects in this table since all plants without exception were inclined to the horizontal and on a southerly bearing, within the limits shown. Differences in height between the three populations do not affect the issue and are presumably due to age as these heaths are periodically burned when the Casuarianas are killed and regenerate from seed. In Population A which is tallest, 20 male bushes were measured at random for height and gave a mean of 4.47 feet. This difference from the female plants is obviously highly significant since if the measurements are paired in the order in which they were recorded the female exceed the male in height in every case. It is hardly worth inquiring whether the small differences in angle of inclination between the three populations are significant, but it may be of interest to examine the differences in compass bearing. On analysis the difference in bearing between the three populations is found to be significant at the 5% level. Since the significant difference at this level is 3.20 deg., the bearing of each population differs significantly from due south (180 deg.).

It is something of a puzzle that the average bearing should in all populations be slightly west of south. The mean bearing of all three populations is 193 deg. If it were due to a heliotropic response, the bearing could be expected to be approximately due south.

It also seems difficult to associate the plants' behaviour with wind, the prevailing wind being NW-NNW in winter and SE-SSE in summer. Nearly all the strong winds, exceeding 20 knots, associated with winter storms, appear to be from the NW quadrant. Are the plants aligning themselves at right angles to these prevailing directions?

Two plants of *C. pinaster* were raised from seed in 1963 and set out in the King's Park Arboretum in 1964, in Perth 200 miles away from the natural habitat. At the time of writing only one has survived, which is a male and has adopted the leaning habit of wild females though not the habit of presentation of minor shoots. This plant has attained a height of 9½ feet, and adopted an inclination to the horizontal of 62 deg. on a compass bearing of 154 deg.

The writer is unable at present to suggest any reason for the strange habit of these plants. Such growth peculiarities are commonly assumed to have some useful adaptive function. The common name "compass bush" is suggested.

Fig. 1—The tallest plant of *Casuarina pinaster* measured in population A, 9½ feet high to tip, inclined at 69 deg. on a bearing of 189 deg. Photographed from the west.

Fig. 2—Close-up of foliage of female plant of *C. pinaster*.